Chapter 7

Future Work

7.1 Parasitic resistance extracted from short pad

According to the equivalent circuit of the short pad, the extracted resistance should be frequency independent. In Fig. 3.7, we can observe that $R_{s,ext}$ is frequency independent except the other two resistances, $R_{g,ext}$ and $R_{d,ext}$. Based on former work, short pad without ground shielding indeed can extract parasitic resistances which are frequency independent. But the ground shielding layout of the test-key has been originally provided by foundry. Is the ground shielding layout the main cause to the frequency dependent resistances? It is worthy to explore what differences between two kinds of short pad layout for small signal.

7.2 Bulk resistance and deep N-well capacitance extraction

In the previous discussion, we have mentioned that it is a bottleneck for 2-port test-key to extract substrate parameters. Although there are some papers discussing substrate parameters extraction, the accuracy problem is remained a challenging issue. For 2-port test-key, therefore, it is a feasible way to optimize these substrate parameters by ADS simulator at present.

For the purpose of extracting systematically, we want to extract substrate parameters directly from measurement data. It is necessary to design 3-port or 4-port test-key in the future to do more substrate research. I think that seeing directly into the bulk terminal would help us extract substrate parameters more easily.

7.3 Small signal equivalent circuit modification

The simulation of small signal equivalent circuit is approximately matched with measurement at present. But the equivalent circuit discussed in detail still remains the potential to be modified to make the simulation results more accurate. More physical mechanism and high frequency responses have to be involved and considered carefully for better simulation results.

Under V_{gs}=V_{ds}=0V and V_{gs}=1.2V, V_{ds}=0V bias condition, the equivalent circuits are almost completed and reliable. Especially under the last bias condition, V_{gs}=V_{ds}=1.2V, we still have to put more effort to verify the universality and accuracy because the construction of the equivalent circuit in my thesis is innovative and never seen in any published papers.

After modifying small signal model at three specific bias conditions, verifying the usage of this model for larger bias range is the following important work.